CLAIMS

1. A bending durability prediction method of predicting a bending durability of a plurality of wires laid at a predetermined bend, and of a bend protection member attached at the bend to protect the plurality of wires by using an infinite element method, the bending durability prediction method comprising:

a setup step of setting up the plurality of wires, the bend protection member, an atmosphere temperature, pre-bending initial shapes for the wires and the bend protection member and final bent shapes for the wires and the bend protection member;

an infinite element model preparation step of preparing infinite element models for the plurality of wires and the bend protection member;

a stress calculation step of calculating stress, for each of infinite elements of the infinite element models, produced by bending the infinite elements from the initial shape to the final bent shape;

a maximum stress search step of searching, among the stresses obtained at the stress calculation step, for the maximum stress for each of the plurality of wires and the bend protection member;

a prediction function acquisition step of obtaining

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prediction functions for the wires, the bend protection member

and the atmosphere temperature designated at the setup step;

a predicting step of referring to the prediction functions

obtained at the prediction function acquisition step, obtaining

5   numbers of bendings for endurance which correspond to the maximum

stresses for the wires and the bend protection member, and

identifying the smallest number of bendings for endurance;

and

an output step of outputting the smallest number of bendings

10   obtained at the predicting step.

2.   The bending durability prediction method according to

claim 1 further comprising:

a specifying step of specifying a position on the wires

15   or the bend protection member corresponding to the smallest

number of bendings for endurance,

wherein the position specified at the specifying step

is output at the output step.

20   3.   The bending durability prediction method according to

claim 1, wherein as the prediction function, a curve is employed

that represents a lower confidence interval relative to a modular

regression function that is statistically obtained based on

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data on the stresses and the number of bendings for endurance which are acquired under a plurality of typical atmosphere temperatures.

5   4.   The bend durability prediction method according to claim 1, further comprising:

a wire arrangement step of arranging, innermost at the bend, a thickest wire of all the plurality of wires.

10   5.   The bend durability prediction method according to claim 1, further comprising:

a storing step of previously storing stress tables which represent minimum stresses according to which it is assumed that the plurality of wires and the bend protection member

15   will be damaged;

a stress table reading step of reading stress tables corresponding to the plurality of wires, the bend protection member and the atmosphere temperature designated in the setup step; and

20   a damaged member specifying step of specifying the wire or the bend protection member that is first damaged, while referring to the stress tables that are read at the stress table reading step and the individual maximum stresses that

are found at the maximum stress search step for the wires and the bend protection member,

the output step outputs information specifying the wire or the bend protection member that is first damaged.

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6.   A bending durability prediction method of predicting a bending durability of a plurality of wires laid at a predetermined bend, and of a bend protection member attached at the bend to protect the plurality of wires by using an infinite element

10   method, the bending durability prediction method comprising:

a storing step of previously storing stress tables which represent minimum stresses according to which it is assumed that the plurality of wires and the bend protection member will be damaged;

.15   a setup step of setting up the plurality of wires, the bend protection member, an atmosphere temperature, pre-bending initial shapes for the wires and the bend protection member and final bent shapes for the wires and the bend protection member;

20   an infinite element model preparation step of preparing infinite element models for the plurality of wires and the bend protection member;

a stress calculation step of calculating stress, for each

of infinite elements of the infinite element models, produced by bending the infinite elements from the initial shape to the final bent shape;

a maximum stress search step of searching, among the stresses obtained at the stress calculation step, for the maximum stress for each of the plurality of wires and the bend protection member;

a stress table reading step of reading stress tables corresponding to the plurality of wires, the bend protection member and the atmosphere temperature designated in the setup step;

a damaged member specifying step of specifying the wire or the bend protection member that is first damaged, while referring to the stress tables that are read at the stress table reading step and the individual maximum stresses that are found at the maximum stress search step for the wires and the bend protection member; and

an output step of outputting information specifying the wire or the bend protection member that is first damaged.

7. The bend durability prediction method according to claim 6, further comprising:

a wire arrangement step of arranging, innermost at the

bend, a thickest wire of all the plurality of wires.

8.   A bending durability prediction apparatus for predicting
a bending durability of a plurality of wires laid at a
5   predetermined bend, and of a bend protection member attached
at the bend to protect the plurality of wires by using an infinite
element method, the apparatus comprising:

a setup unit for setting up the plurality of wires, the
bend protection member, an atmosphere temperature, pre-bending
10   initial shapes for the wires and the bend protection member
and final bent shapes for the wires and the bend protection
member;

an infinite element model preparation unit for preparing
infinite element models for the plurality of wires and the
15   bend protection member;

a stress calculation unit for calculating stress, for
each of infinite elements of the infinite element models,
produced by bending the infinite elements from the initial
shape to the final bent shape;

20   a maximum stress search unit for searching, among the
stresses obtained by the stress calculation unit, for the maximum
stress for each of the plurality of wires and the bend protection
member;

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a prediction function acquisition unit for obtaining prediction functions for the wires, the bend protection member and the atmosphere temperature designated by the setup unit;

a predicting unit for referring to the prediction functions

5   obtained by the prediction function acquisition unit, obtaining numbers of bendings for endurance which correspond to the maximum stresses for the wires and the bend protection member, and identifying the smallest number of bendings for endurance; and

10   an output unit for outputting the smallest number of bendings obtained by the predicting unit.

9.   A computer readable recording medium storing a program for predicting a bending durability of a plurality of wires

15   laid at a predetermined bend, and of a bend protection member attached at the bend to protect the plurality of wires by using an infinite element method, the program causing a computer to function as:

a setup unit for setting up the plurality of wires, the

20   bend protection member, an atmosphere temperature, pre-bending initial shapes for the wires and the bend protection member and final bent shapes for the wires and the bend protection member;

an infinite element model preparation unit for preparing infinite element models for the plurality of wires and the bend protection member;

a stress calculation unit for calculating stress, for each of infinite elements of the infinite element models, produced by bending the infinite elements from the initial shape to the final bent shape;

a maximum stress search unit for searching, among the stresses obtained by the stress calculation unit, for the maximum stress for each of the plurality of wires and the bend protection member;

a prediction function acquisition unit for obtaining prediction functions for the wires, the bend protection member and the atmosphere temperature designated by the setup unit;

a predicting unit for referring to the prediction functions obtained by the prediction function acquisition unit, obtaining numbers of bendings for endurance which correspond to the maximum stresses for the wires and the bend protection member, and identifying the smallest number of bendings for endurance; and

an output unit for outputting the smallest number of bendings obtained by the predicting unit.